A Reference Material for Thermal Diffusivity Measurements

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The laser flash method is very useful for measuring thermal diffusivity, and is used over a wide temperature range. This apparatus requires a reference material for calibration and evaluation of uncertainty. Recently, NMIJ (AIST Japan) developed the use of isotropic graphite (IG 110) as a reference material for the laser flash apparatus. The IG 110 is from 1.3 x 10^{-5} m^2s^{-1} to 1.0 x 10^{-4} m^2s^{-1} and used for a pilot study for CCT WG 9. The pyroceram 9606 as BCR-724 reference material for thermal transport properties was developed by NPL (UK) etc. and distributed by the Institute of Reference Materials and Measurements (IRMM). The thermal diffusivity of Pyroceram 9606 is 1.9 x 10^{-6} m^2s^{-1} to 8.8 x 10^{-7} m^2s^{-1}, with a temperature range from 300 K to 1300 K. We established a laser flash system temperature range of 150 K to 700 K in a vacuum or inactive gas atmosphere and developed a reference material for this system. SiC (silicon carbide) ceramics have an excellent mechanical strength, high thermal shock, and high thermal conductivity. SiC ceramics were obtained by mixing a commercial α-SiC powder with a dopant. The thermal conductivity is controllable by additive materials, and the color of SiC is a controlled using a carbon dopant. Black SiC is very useful for the laser flash system. The thermal diffusivity of SiC varied from 8.0 x 10^{-5} m^2s^{-1} to 4.3 x 10^{-5} m^2s^{-1} at room temperature.